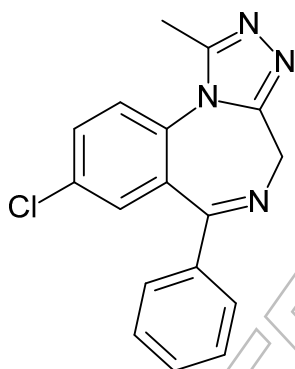




Certificate of Analysis

Reference Standard

Alprazolam



Molecular Formula: $C_{17}H_{13}ClN_4$
Molecular Weight: 308.76
CAS Number: 28981-97-7

Catalogue Number: MM0136.00
Lot Number: 983884
Long-term Storage: 2 to 8 °C, dark
Appearance: white solid
Melting Point: 229 °C
Assay 'as is': 100 %

Date of shipment: **2018-October-29**

This certificate is valid for two years from the date of shipment provided the substance is stored under the recommended conditions unopened in the original container.

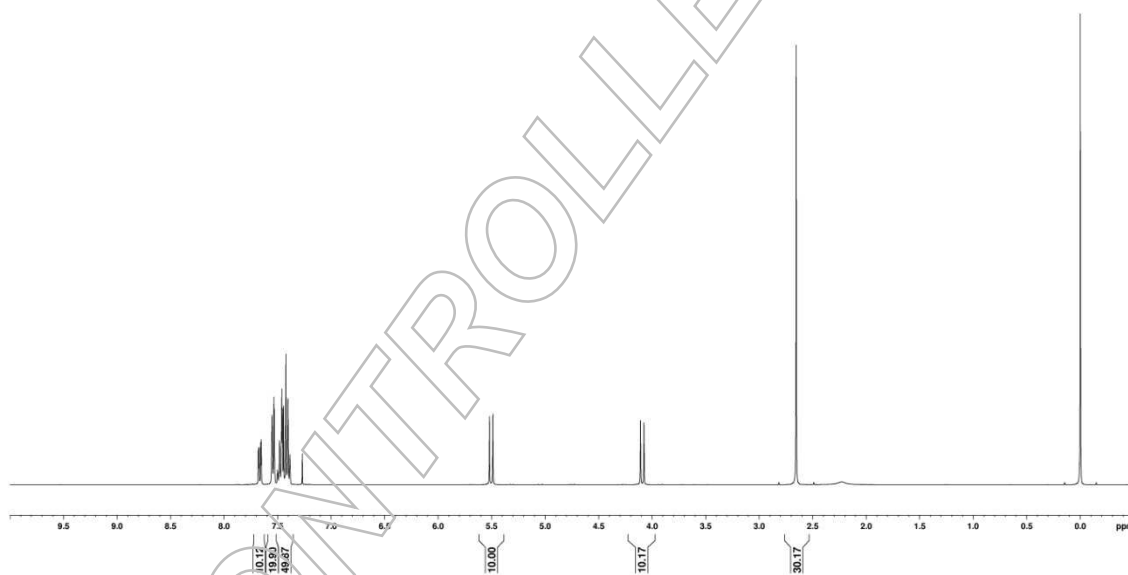


I. Identity

The identity of the reference substance was established by following analyses.

1a. ¹H-NMR Spectrum

Conditions: 400 MHz, CDCl₃

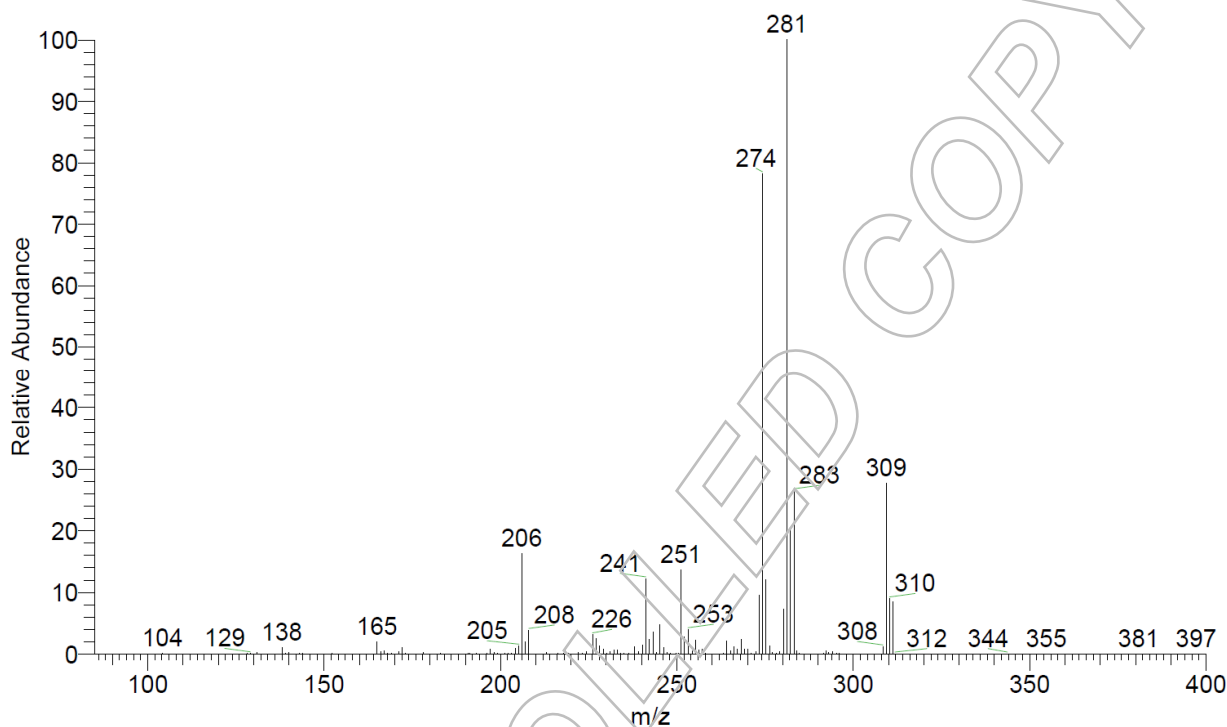


The structure is confirmed by the signals of the spectrum and their interpretation.



Ib. Mass Spectrum

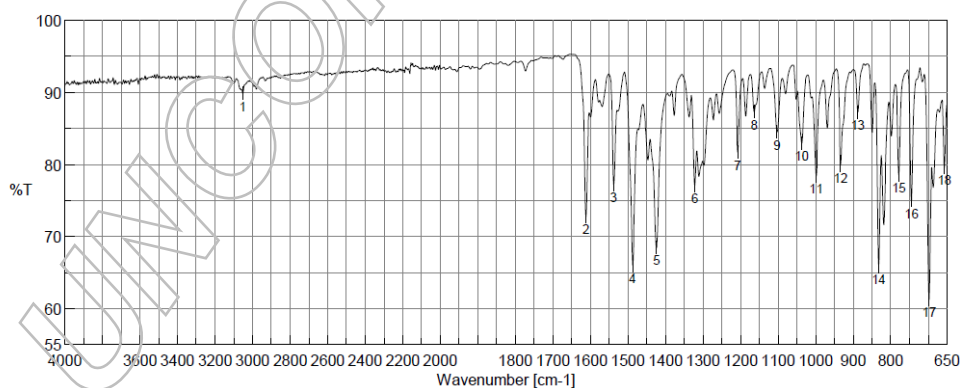
Method: 4.5 kV ESI+; vaporization temperature: 200 °C



The signals of the mass spectrum and their interpretation are consistent with the structural formula.

Ic. IR Spectrum

Method: Attenuated Total Reflection Fourier Transform Infrared (ATR-FTIR) Spectroscopy



The signals of the IR spectrum and their interpretation are consistent with the structural formula.



II. Purity

IIa. High Performance Liquid Chromatography (HPLC)

The purity of the reference substance was analysed by high performance liquid chromatography (HPLC).

HPLC Conditions:

Column:

LiChrospher
60 RP-select B
5 µm, 125 x 4 mm

Conditions:

1.0 ml/min, 40 °C

mob. phase A: 7.7 g/l Ammonium acetate, pH 4.2

mob. phase B: Methanol

Detector:

DAD

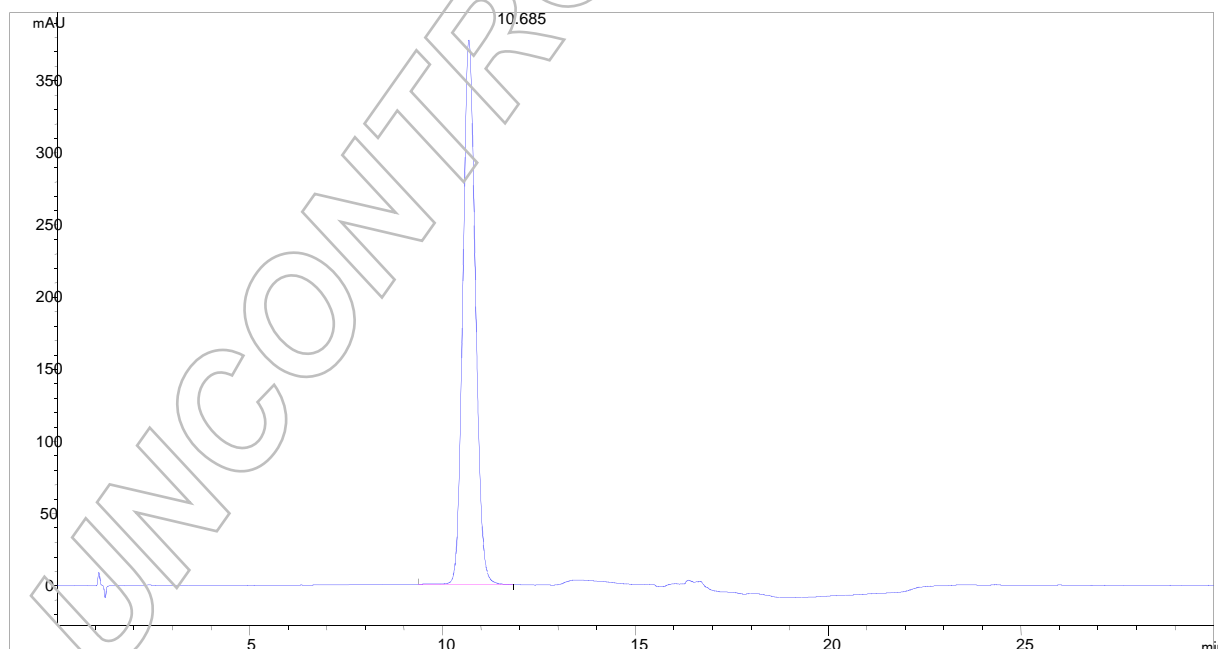
254 nm

Injector:

Auto

4 µl; 0.16976 mg/ml
in Methanol

0-11 min	A/B		55/45
11-14 min	A/B	to	20/80
14-16 min	A/B		20/80
16-20 min	A/B	to	55/45
20-30 min	A/B		55/45 (v/v)





Area Percent Report - Sorted by Signal

Pk #	Retention Time	Area	Area %
1	10.69	8570.26	100.00
Totals		8570.26	100.00

For the calculation the system peaks were ignored. The content of the analyte was determined as ratio of the peak area of the analyte and the cumulative areas of the purities, added up to 100 %.

Results:

Average 100 %
Number of results n=6
Standard deviation < 0.01 %

IIb. Water Content

Method: Karl Fischer titration

No significant amounts of water were detected (< 0.05 %).

IIc. Residual Solvents

Method: ¹H-NMR

No significant amounts of residual solvents were detected (< 0.05 %).

III. Assay by Elementary Analysis (Carbon Titration)

Method: percentage carbon found in relation to percentage carbon as calculated for molecular formula

Results:

Arithmetic mean (n=3) 100.15 % (mass fraction)



IV. Final Result

Chromatographic purity (HPLC)	100.00 %
Water content	No significant amounts of water were detected (< 0.05 %).
Residual solvents	No significant amounts of residual solvents were detected (< 0.05 %).
Assay (100 % method)¹	100.00 %

The assay is assessed to be 100 % 'as is'

The assay 'as is' is equivalent to the assay based on the not anhydrous and not dried substance respectively.

Release Date:

Luckenwalde, 2018-09-13

Dr. Sabine Schröder
Product Release

¹ The calculation of the 100 % method follows the formula:

$$\text{Assay (\%)} = (100 \% - \text{volatile contents}) * \frac{\text{Purity (\%)}}{100 \%}$$

Volatile contents are considered as absolute contributions, purity is considered as relative contribution.